TABLE II

BATTERY VOLTAGE DROP UNDER LOAD
(Incandescent Flashlight Bulbs)

Test Time (Hrs)	Batteries 1A & 1B			Batteries 2A & 2B		
	No Load Voltage	Voltage Under Load	Voltage Drop	No Load Voltage	Voltage Under Load	Voltage Drop
16.25	2.39	1.96	0.43	2.30	1.88	0.47
18.50	2.35	1.89	0.46	2.28	1.89	0.30
20.50	2.30	1.85	0.45	2.20	1.80	0.40
22.25	2.23	1.80	0.43	2.10	1.71	0.39
23.25	2.15	1.61	0.54	2.05	1.51	0.54
24.50	2.11	1.60	0.51	1.90	1.49	0.41
25.75	—	—	—	1.94	1.46	0.48
	TEST DISCONTINUED FOR 9 HOURS					
25.75	2.32	1.70	0.62	2.35	1.75	0.60
26.75	2.08	1.40	0.68	2.01	1.52	0.49
27.90	2.02	1.40	0.62	1.82	1.30	0.52
	TEST DISCONTINUED FOR 21.5 HOURS					
29.50	1.99	1.29	0.70	1.81	1.20	0.61
32.25	1.92	1.35	0.57	1.49*	0.10*	1.39*
	TEST DISCONTINUED FOR 112.5 HOURS					
35.75	2.18	1.31	0.87	2.21*	1.10*	1.11*
	TEST DISCONTINUED FOR 3.25 HOURS					
41.35	1.80	0.91	0.89	1.00*	0.48*	0.52*

*Replacement for Battery 2A

What is claimed is:

1. A battery having a battery strength indicating means to indicate the strength of the battery comprising a battery having a first terminal and a second terminal; a battery indicator and switch means comprising a non-conductive base layer, a non-conductive top layer disposed over the base layer, a first chamber formed between the top layer and the base layer, and a second chamber spaced from the first chamber and formed between the top layer and the base layer; indicating means disposed in the first chamber; first conductive means electrically connected to one terminal of the battery and to one end of the indicating means; second conductive means connected to the opposite end of the indicating means and extending into the second chamber; third conductive means extending from within the second chamber and extending to contact the other terminal of the battery; and whereby the second conductive means and the third conductive means in the second chamber are spaced apart and said second chamber being deformable so that upon pressing of the second chamber the second conductive means will electrically contact the third conductive means thereby placing the indicating means in electrical contact across the terminals of the battery to indicate the strength of the battery.

2. The battery of claim 1 wherein the indicating means in said first chamber undergoes a visible change when subject to at least a pre-determined voltage value.

3. The battery of claim 1 wherein at least the top layer of the first chamber is transparent.

4. The battery of claim 1 wherein at least the top layer of the first chamber is translucent.

5. The battery of claim 1 wherein the indicating means is a chemical redox composition which changes color when the voltage potential across the terminals of the battery crosses a pre-determined voltage.

6. The battery of claim 1 wherein the indicating means is a liquid crystal composition that changes pha-

ses when the electric field across the chamber exceeds a pre-determined value.

7. The battery of claim 1 wherein the second chamber upon being depressed will remain depressed thereby completing the circuit and placing the indicating means across the terminals of the cell.

8. The battery of claim 1 wherein the first conductive means comprises a conductive layer which has a reduced cross-sectional area in said first chamber and the indicating means in said first chamber comprises a heat sensitive color indicating material adapted to undergo a color change when the temperature in said first chamber rises to a pre-determined temperature when the voltage of the current flowing through the conductive layer exceeds a pre-determined value.

9. The battery of claim 1 wherein the first conductive means comprises a conductive layer which has a reduced cross-sectional area in said first chamber and wherein the indicating means comprises a pyrotechnic material adapted to decompose when the temperature of the conductive layer in said first chamber exceeds a pre-determined temperature, the conductive layer in said first chamber is adapted to exceed said pre-determined temperature when the voltage of the current through said conductive layer exceeds a pre-determined value.

10. The battery of claim 1 wherein the first conductive means comprises a conductive layer which has a reduced cross-sectional area in said first chamber such that when the voltage of the current flowing through the conductive layer in said first chamber exceeds a pre-determined value the current flowing through said conductive layer in said first chamber raises the temperature of the conductive layer in the chamber to the melting point of the conductive layer causing the conductive layer to melt at the reduced cross-sectional area.

11. The battery of claim 1 wherein the indicating means is a light emitting diode that undergoes a visible change when the voltage applied to the light emitting diode crosses a pre-determined value.

12. A battery having a battery strength indicator comprising:

a nonrechargeable dry cell battery having a first terminal and a second terminal;

a battery strength indicator formed in a layer attached to a side of said battery which undergoes a visible change when subject to a predetermined voltage output of said battery and a first conductor electrically connected between one end of said indicator and said first battery terminal; and

a battery switch comprising a resilient, nonconductive, deformable layer on a side of said battery, a switch chamber disposed beneath said resilient layer, and a second conductor

extending from said switch chamber and connected to the other end of the indicator, said portion of said second conductive lead within said switch chamber comprising a switch contact, said battery switch being biased in an electrically open position,

whereby upon pressing of the resilient layer over said switch chamber, the switch contact will be placed in electrical contact with a conductive layer in electrical contact with said second battery terminal, thereby placing the indicator in electrical contact across the terminals of the battery to quickly indicate to the user the strength of the battery.

13. A voltage indicator comprising:

A) a dielectric layer;

B) a conductive layer above or below one of the surfaces of the dielectric layer; and

C) a temperature sensitive color indicator material in thermal contact with the conductive layer, characterized in that the conductive layer has i) a portion of a sealed chamber, cell or bubble below one of its surfaces and ii) sufficient heat generating capacity to effect a change in the temperature sensitive color indicator material.

14. The voltage indicator of claim 13 wherein the temperature sensitive color indicator material is formed from a material which undergoes a non-permanent color change when exposed to a predetermined temperature.

15. The voltage indicator of claim 13 wherein the temperature sensitive color indicator material undergoes a

visible color change when exposed to a predetermined temperature.

16. An article comprising an integral battery voltage indicator having:

A) a dielectric layer;

B) a conductive layer above or below the dielectric layer; and

C) a temperature sensitive color indicator material in thermal contact with the conductive layer, characterized in that:

1) the conductive layer has i) sufficient heat generating capacity to effect a change in the temperature sensitive color indicator material and ii) sufficient non-conducting means under one of its surfaces to permit the heat generated by the conductive layer to change the color of the temperature sensitive color indicator material and indicate voltage when the voltage indicator is in contact with a battery housing, and

2) the voltage indicator includes means for forming an electrical switch with an electrically conductive portion of the battery housing.

17. An article comprising an integral battery voltage indicator having a plurality of layers in the following order:

A) a dielectric layer;

B) a conductive layer;

C) one or more substrate layers; and

D) a temperature sensitive color indicator material in thermal contact with the conductive layer, characterized in that:

1) the conductive layer has i) sufficient heat generating capacity to effect a change in the temperature sensitive color indicator material and ii) sufficient non-conducting means

under one of its surfaces to permit the heat generated by the conductive layer to change the color of the temperature sensitive color indicator material and indicate voltage when the voltage indicator is in contact with a battery housing, and

2) the voltage indicator includes means for forming an electrical switch with an electrically conductive portion of the battery housing.

18. An article according to claim 16 or 17 wherein the non conducting means is formed by placing a nonconductive material under the conductive layer.

19. An article according to claim 16 or 17 wherein the nonconducting means forms a sealed chamber, cell or bubble.

20. A battery having an article with an integral battery voltage indicator, wherein the voltage indicator comprises:

A) a dielectric layer;

B) a conductive layer above or below the dielectric layer; and

C) a temperature sensitive color indicator material in thermal contact with the conductive layer, characterized in that:

1) the conductive layer has i) sufficient heat generating capacity to effect a change in the temperature sensitive color indicator material and ii) sufficient non-conducting means under one of its surfaces to permit the heat generated by the conductive layer to change the color of the temperature sensitive color indicator material and indicate voltage when the voltage indicator is in contact with a battery housing, and

2) the voltage indicator includes means for forming an electrical switch with

an electrically conductive portion of the battery housing.

21. A battery having an article with an integral battery voltage indicator, wherein the integral battery voltage indicator comprises a plurality of layers in the following order:

A) a dielectric layer;

B) a conductive layer;

C) one or more substrate layers; and

D) a temperature sensitive color indicator material in thermal contact with the conductive layer, characterized in that:

1) the conductive layer has i) sufficient heat generating capacity to effect a change in the temperature sensitive color indicator material and ii) sufficient non-conducting means under one of its surfaces to permit the heat generated by the conductive layer to change the color of the temperature sensitive color indicator material and indicate voltage when the voltage indicator is in contact with a battery housing, and

2) the voltage indicator includes means for forming an electrical switch with an electrically conductive portion of the battery housing.

22. A battery according to claim 20 or 21 wherein the nonconducting means is formed by inserting a nonconductive material between the battery surface and the conductive layer.

23. A battery according to claim 21 wherein the nonconducting means comprises means for forming a sealed chamber, cell or bubble.

24. A battery with an integral voltage indicator comprising:

a battery having an anode and a cathode and being defined by a battery housing, and

a voltage indicator integral with said battery, said voltage indicator comprising:

a conductive layer;

a temperature sensitive color indicator material in thermal contact with the conductive layer wherein the conductive layer has sufficient heat generating capacity to effect a change in the temperature sensitive color indicator material;

means to prevent conduction between the conductive layer and the battery housing to permit the heat generated by the conductive layer to change the color of the temperature sensitive color indicator material and indicate voltage when the voltage indicator is in contact with a battery housing; and

electrical switch means positioned, when activated, to electrically connect the conductive layer and a conductive portion of the battery housing to effect a color change in the temperature sensitive color indicator material.

25. A battery according to claim 24, wherein the conductive layer has a portion reduced to a small cross sectional area and is positioned so that current can flow between the conductive layer and reduced cross section area when the electrical switch means is activated, wherein the extent to which the conductive layer is heated at the reduced cross sectional area is related to the battery's voltage and the extent to which the temperature sensitive color indicator material undergoes a color change indicates the voltage and level of heating.

26. A battery according to claim 24, wherein the means to prevent conduction is a nonconductive material.

27. A battery according to claim 24, wherein the means to

prevent conduction comprises a sealed chamber, cell or bubble.

28. A battery according to claim 24, wherein the temperature sensitive color indicator material is formed from a material which undergoes a non-permanent color change when exposed to a predetermined temperature.

29. A battery according to claim 24, wherein the temperature sensitive color indicator material undergoes a visible color change when exposed to a predetermined temperature.

30. A voltmeter comprising:

A) a dielectric layer;

B) a conductive layer above or below one of the surfaces of the dielectric layer; and

C) a temperature sensitive color indicator layer in thermal contact with the conductive layer, characterized in that the conductive layer has i) an air pocket under one of its surfaces and ii) sufficient heat generating capacity to affect a change in the temperature sensitive color indicator layer.

31. The voltmeter of claim 30 wherein the insulating means is formed by placing a temperature insulating material under the conductive layer.

32. The voltmeter of claim 30 wherein the color indicator layer changes from:

A) a color to colorless;

B) colorless to a color; or

C) one color to a second color.

33. A label comprising an integral battery voltmeter having:

A) a dielectric layer;

B) a conductive layer above or below the dielectric layer; and

C) a temperature sensitive color indicator layer in thermal

contact with the conductive layer, characterized in that 1) the conductive layer has i) sufficient heat generating capacity to affect a change in the temperature sensitive color indicator layer and ii) sufficient thermal insulating means under one of its surfaces to overcome heat sinking when the voltmeter is in contact with a battery having an electrically conductive housing and 2) the voltmeter includes means for forming an electrical switch with the electrically conductive battery housing.

34. A label comprising an integral battery voltmeter having a plurality of layers in the following order:

A) a dielectric layer;

B) a conductive layer;

C) one or more substrate layers for the label;

D) a temperature sensitive color indicator layer; and characterized in that 1) the conductive layer has i) sufficient heat generating capacity to affect a change in the temperature sensitive color indicator layer and ii) sufficient thermal insulating means under one of its surfaces to overcome heat sinking when the voltmeter is in contact with a battery having an electrically conducting housing and 2) the voltmeter includes means for forming an electrical switch with the electrically conductive battery housing.

35. A label according to claim 33 or 34 wherein the temperature insulating means is formed by placing a temperature insulating material under the conductive layer.

36. A label according to claim 33 or 34 wherein the temperature insulating means forms an air pocket.

37. A battery having a label with an integral voltmeter; wherein the voltmeter comprises:

A) a dielectric layer;

B) a conductive layer above or below the dielectric layer; and

C) a temperature sensitive color indicator layer in thermal contact with the conductive layer, characterized in that 1) the conductive layer has i) sufficient heat generating capacity to affect a change in the temperature sensitive color indicator layer and ii) sufficient thermal insulating means under one of its surfaces to overcome heat sinking when the voltmeter is in contact with a battery having an electrically conducting housing and 2) the voltmeter includes means for forming an electrical switch with the electrically conductive battery housing.

38. A battery having a label with an integral voltmeter; wherein the voltmeter comprises a plurality of layers in the following order;

A) a dielectric layer;

B) a conductive layer;

C) one or more substrate layers for the label; and

D) a temperature sensitive color indicator layer, characterized in that 1) the conductive layer has i) sufficient heat generating capacity to affect a change in the temperature sensitive color indicator layer and ii) sufficient thermal insulating means under one of its surfaces to overcome heat sinking when the voltmeter is in contact with a battery having an electrically conducting housing and 2) the voltmeter includes means for forming an electrical switch with the electrically conductive battery housing.

39. A battery according to claim 37 or 38 wherein the insulating means is formed by inserting a temperature insulating material between the battery surface and the conductive layer.

40. A battery according to claim 38 wherein insulating means is an air pocket under the dielectric substrate under the area of the conductive layer.

41. The voltmeter of claim 30 wherein the temperature sensitive color indicator layer is formed from a color reversible temperature sensitive material selected from the group consisting of thermochromic inks, liquid crystalline material and thermochromic inks, liquid crystalline materials and thermochromic tapes.

42. The voltmeter of claim 30 wherein the temperature sensitive color indicator layer changes from:

A) a color to colorless;

B) colorless to a color; or

C) one color to a second color.

43. A battery according to claim 38 wherein the thermal insulating means comprises means for forming an air pocket under the dielectric layer.

44. A battery with an integral voltmeter comprising:

a battery having terminals of opposite polarity and being defined by a battery can and

a voltmeter integral with said battery, said voltmeter comprising:

a conductive layer;

a temperature sensitive color indicator layer in thermal contact with the conductive layer, wherein the conductive layer has sufficient heat generating capacity to effect a change in the temperature sensitive color indicator layer;

means to provide thermal insulation between the conductive layer and the battery can to prevent the battery from acting as a heat sink for the conductive layer; and

electrical switch means positioned, when activated, to couple electrically the conductive layer and the battery can so that current may flow through the conductive layer to effect a color change in the temperature sensitive color indicator layer.

45. A battery according to claim 44, wherein the conductive layer has a narrow portion which widens along at least part of the conductive layer to a wide portion and is positioned so that current can flow between the narrow and wide portions when the electrical switch means is activated, wherein the extent to which the conductive layer is heated between the wide and narrow portions is related to the battery's voltage and the extent to which the temperature sensitive color indicator layer undergoes a color change indicates the voltage and level of heating.

46. A battery according to claim 44 wherein the means to provide thermal insulation is a thermal insulation material.

47. A battery according to claim 44, wherein the means to provide thermal insulation comprises standoffs on the dielectric layer adjacent the battery can, wherein the standoffs, the dielectric layer, and the battery can define an air pocket.

48. A battery according to claim 44 wherein the temperature sensitive color indicator layer is formed from a color reversible temperature sensitive material selected from group consisting of thermochromic inks, liquid

crystalline materials, and thermochromic tapes.

49. A battery according to claim 44 wherein the temperature sensitive color indicator layer changes from:

A) a color to colorless;

B) colorless to a color; or

C) one color to a second color.

50. An article comprising an integral battery voltage indicator having:

A) a dielectric layer;

B) a conductive layer above or below the dielectric layer; and

C) a temperature sensitive color indicator material in thermal contact with the conductive layer, characterized in that:

1) the conductive layer has i) sufficient heat generating capacity to effect a change in the temperature sensitive color indicator material and ii) coupling means to permit the heat generated by the conductive layer to change the color of the temperature sensitive color indicator material and indicate voltage when the voltage indicator is in contact with a battery housing, and

2) the voltage indicator includes means for forming an electrical switch with an electrically conductive portion of the battery housing.